

Installation of Soil Borings and Piezometers at Steamboat Creek, Nevada, Section 1135

Introduction

This report presents the results of installation of soil borings and piezometers at Steamboat Creek, Nevada, Station 1135. Four soil borings were drilled to a depth of 19.5 feet each on March 13 and 14, 2003, on agricultural land north of Steamboat Creek, south of the Truckee River, and west of the Reno-Sparks Wastewater Treatment Plant. This work was performed by CH2M HILL under contract with the U.S. Army Corps of Engineers (COE). Three borings (COE1, COE2, and COE3), located on the south and north edges of the agricultural field, were completed as water-level piezometers; a fourth boring, located in the middle of the field, was backfilled so it would not interfere with agricultural activities (Figure 1).

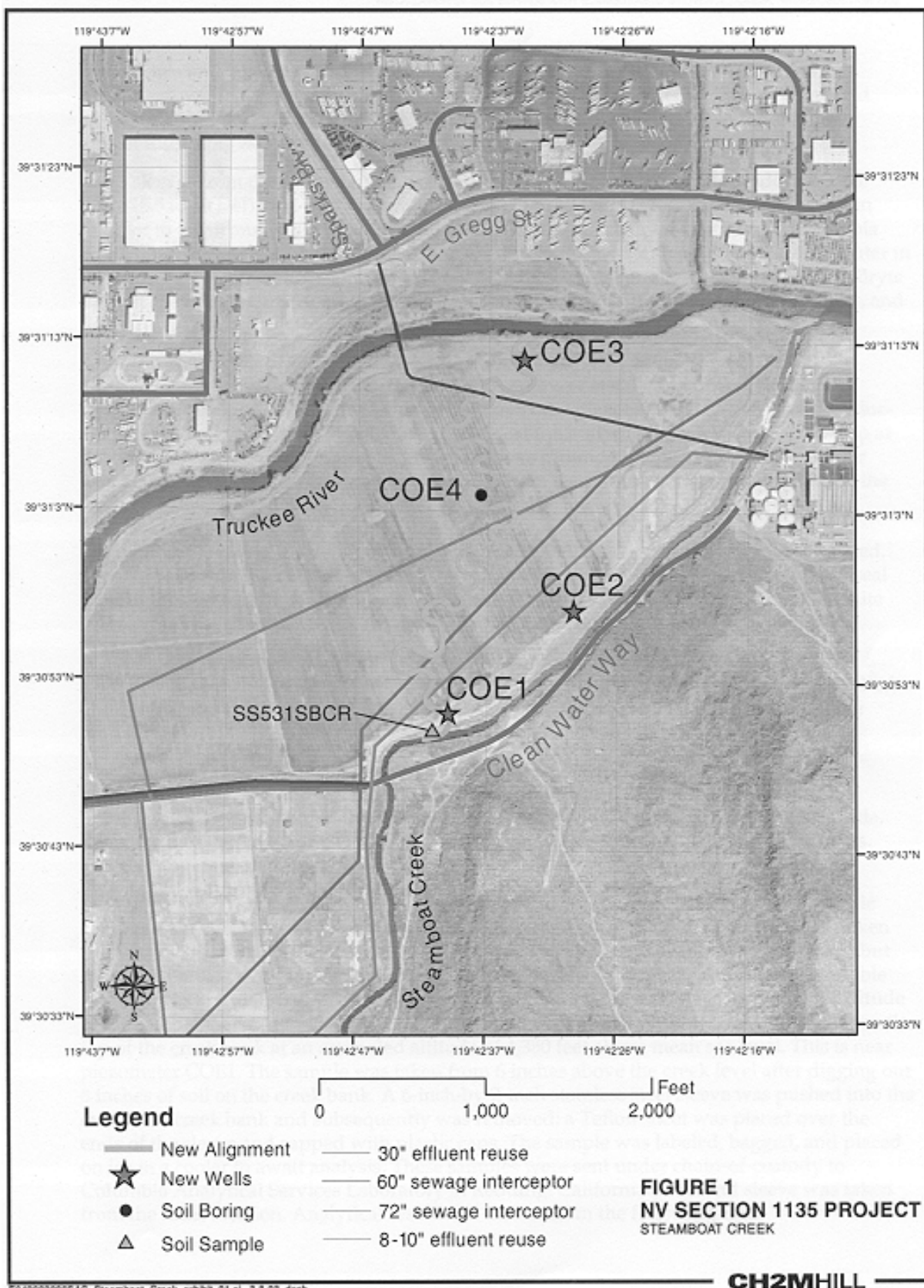
Boart Longyear Drilling Company of Dayton, Nevada, performed the drilling and piezometer installation using a CME-75 truck-mounted hollow-stem auger rig under the supervision of Rob Pexton of CH2M HILL.

Underground Service Alert, a regional utility location clearing center, was contacted to perform utility clearances before performing the work. A variety of utilities run under the property including 60- and 72-inch-diameter sewage interceptor lines, and 10- and 30-inch-diameter effluent reuse lines carrying treated effluent (marked on Figure 1). Consultations with personnel from the University of Nevada, Reno, the City of Reno, and the Truckee Meadows Water Authority (who operate the treatment plant), helped locate a water supply line and a reuse line crossing the northeast corner of the field. There is a 16-inch-diameter abandoned effluent reuse line along the south edge of the field. In addition, overhead power lines run along the south edge of the field. Piezometers COE1 and COE2 were moved slightly from their planned locations to keep a minimum 15-foot clearance from the power lines and to maintain a safe distance from the 16-inch-diameter abandoned effluent line.

Sampling and Analysis

Soil was hand augured to a depth of 4 to 5 feet, a few inches on either side of each soil boring to ensure that no utilities were encountered. The borings were sampled continuously with a Standard Penetration Sampler (SPT) from 1 foot to 19.5 feet below grade in 18-inch intervals (1 to 2.5 feet, 2.5 to 4 feet, etc.). The sampler was driven down by blows from an automatic 140-pound hammer dropping 30 inches at a time to advance the sampler below the 8-inch-diameter hollow-stem auger. Blow counts were recorded for each 6-inch advance of the sampler for the 18 inches each sample was driven (typically 3-2-3). The boring logs in Appendix A provide this blow count information. Blow counts were low for all borings, indicating that the soil can be easily excavated. After each sample was driven, the augurs were advanced 18 inches down to the bottom of the sampler and the sampler was retrieved.

Three 6-inch-long brass sleeves were placed inside each sampler before driving it. After the sampler was driven and retrieved, the sleeves that were filled with soil were capped with



plastic caps and labeled with the boring number, depth interval, date, and an arrow pointing down. They were then placed in plastic bags labeled with the date, location, and 18-inch-depth interval for the sampler. Sample recovery was often poor in the shallower part of the boring because the soils were so soft.

Brass sleeves from the first sample drive for each boring (1 to 2.5 feet), the middle sample drive (8.5 to 10 feet), and the final sample drive (19 to 19.5 feet) were each placed on ice in a cooler to await analysis. These samples were sent under "chain-of-custody" to Columbia Analytical Services Laboratory in Redding, California. Analytical results are discussed later in this report. The remaining samples were taken in their brass sample sleeves to the COE Bryte Yard at 1645 River Bank Road in Bryte (West Sacramento), California, on March 24, 2003, and delivered to Andy Pruitt of the COE.

After the total depth of 19.5 feet was reached in borings COE1, COE2, and COE3, a 2-inch-diameter Schedule 40 PVC plastic piezometer was installed in the borehole. Appendix A includes Well completion diagrams. These piezometers have 5 feet of machine-slotted (0.020-inch wide slots) peizometer screen at the bottom with a 6-inch plastic sump at the bottom and solid PVC casing to 33 inches above ground surface. A graded sand filter was installed next to the PVC screen, extending from the bottom of the boring up above the well screen to 11 feet below grade. Sand was added as the augurs were slowly removed from the borehole, always keeping some sand up inside the hollow-stem auger, and frequently measuring the depth of sand with a weighted tape. After the sand was installed, 2 feet of bentonite pellets were placed above the sand and allowed to hydrate to form a seal around the piezometer. Cement-bentonite grout was then tremmied in above the bentonite up to ground surface.

A 2-foot-square concrete pad 4 inches deep was poured with the top at ground surface; a 5-foot-long 4-inch-square galvanized steel well monument with a hinged top was installed around the well to a height of 3 feet abovegrade. A brass disk was glued to the top of the monument with COE1, COE2, or COE3 stamped on it, as appropriate.

The locations of the wells were measured with a hand-held Gorman GPS unit and water levels were measured on March 20, 2003. The vertical control of portable GPS units is unreliable and did not match the topographic maps provided by the University of Nevada, Reno, for the site. Therefore, vertical elevations are estimated from the topographic maps. Table 1 provides locations.

A hand sample from the south bank of Steamboat Creek was analyzed for volatile organic compounds (VOC) using EPA Method 8260. The sample was originally planned to be taken from approximately 300 feet east of the Clean Water Way Bridge over Steamboat Creek, but the south bank is a 10-foot vertical cliff along that stretch of the creek. The closest accessible location was approximately 531 feet downstream from the bridge. The longitude and latitude of the sample are W 119° 42' 41.2" and N 39° 30' 49.6". The sample was taken 10 feet below the top of the creek bank at an estimated altitude of 4,380 feet above mean sea level. This is near piezometer COE1. The sample was taken from 6 inches above the creek level after digging out 8 inches of soil on the creek bank. A 6-inch-by-2-inch stainless steel sleeve was pushed into the excavated creek bank and subsequently was removed; a Teflon sheet was placed over the ends of the sleeve and capped with plastic caps. The sample was labeled, bagged, and placed on ice in a cooler to await analysis. These samples were sent under chain-of-custody to Columbia Analytical Services Laboratory in Redding, California. A second sleeve was taken from the same location. Analytical results are discussed in the following text.

TABLE 1
Piezometer, Boring, and Hand Sample Locations at Steamboat Creek, Nevada, Section 1135 Project Site

Location Name	Longitude ^a	Latitude ^a	Elevation ^b
COE1 piezometer	119°, 42', 40.1"	39°, 30', 51.0"	4,390'
COE2 piezometer	119°, 42', 29.7"	39°, 30', 56.7"	4,390'
COE3 piezometer	119°, 42', 34.0"	39°, 31', 11.8"	4,392'
COE4 soil boring	119°, 42', 37.0"	39°, 31', 03.5"	4,388'
SS531SBCR soil sample	119°, 42', 41.2"	39°, 30', 49.6"	4,380'

^a Longitude and latitude are measured in degrees, minutes, and seconds.

^b Elevation is measured as feet mean sea level, as taken from the topographic map provided by the University of Nevada, Reno.

Chemical Analysis Results

The three sleeves taken from the top, middle, and bottom of each borehole were composited by the laboratory before analysis, giving a single sample for borings COE1 through COE4. These were analyzed for the following parameters: metals, soluble metals (per the California Toxic Characteristic Leaching Procedure), mercury, methyl mercury, and total sulfur. Tables 2 through 4 show the results of the analysis. Appendix B presents the original lab data sheets.

TABLE 2
Composite Sample Results for Metals at Steamboat Creek, Nevada, Section 1135 Project by Method SW6010B with Mercury by Method 7470

Analyte	Detection Limit (mg/Kg)	Sample COE1	Sample COE2	Sample COE3	Sample COE4
Antimony, Sb	15.6	ND, U	ND, U	ND, U	ND, U
Arsenic, As	15.6	55.2	14.8	9.2 B	12.6
Barium, Ba	1.7	120	149	212	200
Beryllium, Be	1.7	0.43 B	0.37 B	0.45 B	0.40 B
Cadmium, Cd	1.7	0.46 B	0.13 B	1.0 B	0.88 B
Chromium, Cr	3.5	15.5	19.1	23.2	25.0
Cobalt, Co	5.2	13.2	11.0	11.7	10.5
Copper, Cu	3.5	65.8	33.6	66.6	67.2
Lead, Pb	17.4	6.1 B	4.8 B	24.5	15.4
Molybdenum, Mo	5.2	5.6	1.8 B	2.2 B	1.8 B
Nickel, Ni	6.9	11.6	12.0	20.6	19.4
Selenium, Se	0.65	0.17 B	ND, U	0.23 B	0.20 B
Silver, Ag	3.5	0.90 B	ND, U	9.9	11.3

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Antimony, Sb	16.6	ND, U	ND, U	ND, U	ND, U
Arsenic, As	15.6	55.2	14.8	9.2 B	12.6
Barium, Ba	1.7	120	149	212	200
Beryllium, Be	1.7	0.43 B	0.37 B	0.45 B	0.40 B
Cadmium, Cd	1.7	0.48 B	0.13 B	1.0 B	0.88 B
Chromium, Cr	3.5	15.5	19.1	23.2	25.0
Cobalt, Co	5.2	13.2	11.0	11.7	10.5
Copper, Cu	3.5	65.8	33.6	66.6	67.2
Lead, Pb	17.4	6.1 B	4.8 B	24.5	15.4
Molybdenum, Mo	5.2	6.6	1.8 B	2.2 B	1.8 B
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Analyte	Detection Limit (mg/Kg)	Sample COE1	Sample COE2	Sample COE3	Sample COE4
Thallium, Tl	0.82	ND, U	ND, U	ND, U	ND, U
Vanadium, V	3.5	75.2	100	74.4	77.9
Zinc, Zn	6.9	90.5	83.2	139	126

ND: not detected

U: The value was less than the method detection limit or was not detected.

B: The analyte is found in the associated blank as well as the sample.

TABLE 3
Composite Sample Results for Soluble Metals (TCLP) at Steamboat Creek, Nevada, Section 1135 Project*

Analyte	Detection Limit (mg/kg)	Sample COE1	Sample COE2	Sample COE3	Sample COE4
Antimony, Sb	0.045	ND, U	ND, U	ND, U	ND, U
Arsenic, As	0.045	0.40	ND, U	ND, U	0.082
Barium, Ba	0.0050	0.23	0.65	0.34	0.23
Beryllium, Be	0.0060	ND, U	ND, U	ND, U	ND, U
Cadmium, Cd	0.0060	ND, U	ND, U	ND, U	0.0061
Chromium, Cr	0.010	ND, U	ND, U	ND, U	ND, U
Cobalt, Co	0.015	0.028	0.022	ND, U	ND, U
Copper, Cu	0.010	ND, U	0.014	0.034	0.038
Lead, Pb	0.060	ND, U	ND, U	ND, U	ND, U
Mercury, Hg	0.00030	ND, U	ND, U	ND, U	ND, U
Molybdenum, Mo	0.015	0.033	ND, U	ND, U	ND, U
Nickel, Ni	0.020	ND, U	0.022	0.036	0.046
Selenium, Se	0.10	ND, U	ND, U	ND, U	ND, U
Silver, Ag	0.010	ND, U	ND, U	ND, U	ND, U
Thallium, Tl	0.050	ND, U	ND, U	ND, U	ND, U
Vanadium, V	0.010	0.053	0.018	0.014	ND, U
Zinc, Zn	0.020	0.10	0.19	0.18	0.25

ND: not detected

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* All samples except mercury were analyzed using EPA Method SW6010B; mercury was analyzed using EPA Method 7470.

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Thallium, Tl	0.82	ND, U	ND, U	ND, U	ND, U
Vanadium, V	3.5	75.2	100	74.4	77.9
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Antimony, Sb	0.045	ND, U	ND, U	ND, U	ND, U
Arsenic, As	0.045	0.40	ND, U	ND, U	0.082
Barium, Ba	0.0050	0.23	0.65	0.34	0.23
Beryllium, Be	0.0060	ND, U	ND, U	ND, U	ND, U
Cadmium, Cd	0.0060	ND, U	ND, U	ND, U	0.0061
Chromium, Cr	0.010	ND, U	ND, U	ND, U	ND, U
Cobalt, Co	0.015	0.028	0.022	ND, U	ND, U
Copper, Cu	0.010	ND, U	0.014	0.034	0.038
Lead, Pb	0.060	ND, U	ND, U	ND, U	ND, U
Mercury, Hg	0.00030	ND, U	ND, U	ND, U	ND, U
Molybdenum, Mo	0.015	0.033	ND, U	ND, U	ND, U
Nickel, Ni	0.020	ND, U	0.022	0.036	0.046
Selenium, Se	0.10	ND, U	ND, U	ND, U	ND, U
Silver, Ag	0.010	ND, U	ND, U	ND, U	ND, U
Thallium, Tl	0.050	ND, U	ND, U	ND, U	ND, U
Vanadium, V	0.010	0.053	0.018	0.014	ND, U
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